THE

Saturday Magazine.

No. 571. MAY 29TH, 1841. {Price One Penny.

THE BANKS OF THE THAMES.

THE SOURCE OF THE THAMES.

Thou, too, great father of the British floods!
With joyful pride survey'st our lofty woods,
Where towering oaks their growing honours rear,
And future navies on thy shores appear,
Not Neptune's self from all her streams receives
A wealthier tribute than to thine he gives.
No seas so rich, so gay no banks appear,
No lake so gentle, and no spring so clear,
Nor Po so swells the fabling poet's lays,
While led along the skies his current strays,
As thine.——Pope.

How many and varied are the associations which the name of the river Thames suggests to the mind! How proudly may we compare this river with those which water foreign lands, and point to its commercial importance as a compensation for its comparatively limited size! It is no exaggeration to say, that more wealth floats on the bosom of this river than on any other in the world, and that no other river is visited by the natives of so many climes.

But it is not only in a commercial point of view that the Thames demands our notice. Its banks are studded with beautiful towns, villages, fields, gardens, and country residences, giving to the scenery all those characteristics which mark a highly cultivated country. These objects are well worthy of a little attention, and we propose, in the course of a series of articles, to take a rapid glance at the chief objects of interest which present themselves, from the source of the river, in Gloucestershire, to its termination in the English Channel, as also the associations connected with places situated on its banks.

The general course of the Thames is from west to east, passing through or between the counties of Gloucester, Wilts, Berks, Oxford, Buckingham, Surrey, Middlesex, Essex, and Kent. It derives its origin from a copious spring, called the *Thames Head*, about three miles south-west of the town of Cirencester, in Gloucestershire. The river is generally known by the name of the Isis, until it receives the waters of the Thame in Oxfordshire, after which it is called the *Thames*,—a name supposed to be compounded of the other two. From its source it flows as a small rivulet to Cricklade, in Wiltshire, near which it receives several tributary streams, from whence its course leads towards Lechlade, a town situated near the confines of Berkshire, Gloucestershire, and Oxfordshire, where it receives the waters of the Lech and the Colne, and becomes navigable for vessels of a hundred tons' burden, although at a distance, measured along the river, of a hundred and forty miles above London. The river then passes in succession the towns of Buscot, Farringdon, Stanton Harcourt, and Ensham, until it reaches the city of Oxford, its course hitherto having been somewhat northward. It then takes a sudden bend towards the south; and, after passing near Iffley and Nuneham, receives the river Thame on its

northern shore. Forming the boundary between the counties of Buckingham and Berks, it passes through a beautiful country, approaching more or less near to the towns of Wallingford, Mapledurham, Reading, Henley, Great Marlow, Cliefden, Maidenhead, Windsor, Eton, Staines, &c. We then come to the counties of Middlesex and Surrey where the banks of the river show us in succession Chertsey, Sunbury, Hampton, Kingston, Twickenham, Richmond, and Kew. From this point may be said to commence the commercial character of the river, its banks being occasionally diversified with mills and manufactories of various kinds, till we arrive at the Metropolis. Passing the forest of masts and the dense masses of houses which here present themselves, we come in succession to Deptford, Greenwich, Woolwich, Erith, Purfleet, Gravesend, and a few other towns,—till at length the river, now presenting a majestic breadth, pours its waters into the sea, after a course of somewhat more than two hundred miles. Such being the course which the river pursues, we proceed to notice the objects met with by the way.

The spring to which the river owes its origin rises in a field in the parish of Cotes, Gloucestershire. The infant rivulet flowing from the spring passes under the road leading from Cirencester to Bath, and is joined by several other springs similar to itself, by which its width is increased to about twelve yards, and at the village of Cotes it is crossed by the first bridge, formed of a few large stones, laid in piles.

A course of about ten or twelve miles brings the stream to Cricklade, a pleasant town, containing about sixteen hundred inhabitants, and rendered famous by many contests which took place near it in the times of the Saxons: it consists principally of one long street, in the midst of a level country on the south side of the stream. A further course of about eight miles brings us to Lechlade, or Leachlade, a spot described by Leland as a "praty old village, with a stone spire to the church." The name is compounded of two Saxon words, *lech* and *ladian*,—the former signifying a stone, and being the name given to a small river which flows into the Isis at this part, and the waters of which have a slightly petrifying quality,—the latter being the Saxon verb *to empty*, in allusion to this confluence. The town is situated on the margin of the river, is neatly built, and consists principally of one long and wide street, inhabited by about twelve hundred persons. The river begins to be of importance at this place, for Lechlade is a stopping-place for wagons, laden with cheese and other commodities from Wiltshire and Gloucestershire, the rest of the transfer to the Metropolis being effected by navigation. Vessels of sixty tons' burden are capable of reaching this spot, but the frequent deficiency of water in the summer, as well as the floods in winter, have rendered the navigation of the river rather uncertain, and not so valuable to the inhabitants as it would otherwise have been. About half a mile on the London side of the town is St. John's bridge, considered to be one of the most ancient bridges on the Thames, and built at the time when a priory was flourishing in the immediate neighbourhood, several centuries ago; the bridge is of very curious form and of great strength.

Still continuing our course, pretty nearly in an eastern direction, we pass about midway between the towns of Farringdon and Bampton, the former lying southward, in Berkshire, and the latter northward, in Oxfordshire. Farringdon is a very ancient town, small, neat, well-built, and paved, and the navigation of the neighbouring river furnishes a medium for the conveyance of coal and other heavy articles from Gloucestershire and Somersetshire to London. The Great Western Railway, however, which has a station near Farringdon, is likely to affect considerably the navigation of the Thames at this part. Farringdon is not far from the celebrated Vale of the White Horse, a name derived from the figure of a white horse, cut in the chalky soil, and kept clear from grass. The popular opinion respecting this figure is that it was formed in commemoration of a victory obtained by Alfred the Great over the Danes.

Bampton, situated on the opposite side of the river, is a very ancient town, containing about fifteen hundred inhabitants, and situated near the banks of the river, on which there are many convenient wharfs.

The road from Farringdon to Bampton crosses the Thames at Radcote bridge, an object not only picturesque in appearance, and curious from its antiquity, but interesting also from historical recollections. It was the scene of a remarkable battle, fought, in the year 1387, between the Earl of Derby, afterwards King Henry the Fourth, and De Vere, earl of Oxford. The latter was defeated, but saved his life by plunging on horseback into the Thames, and swimming to the opposite bank,—an exploit which has been commemorated in the following stanza of the poem of *The Thame and the Isis*.

> Here Oxford's hero, famous for his boar,
> While clashing swords upon his target sound,
> And showers of arrows from his breast rebound,
> Prepared for worst of fates, undaunted stood,
> And urged his beast into the rapid flood:
> The waves in triumph bore him, and were proud
> To sink beneath their honourable load.

Mr. Ireland, who described the Thames half a century ago, when projects of canal-cutting were as much in favour as the construction of railroads at the present day, regretted the deserted appearance presented by the Thames, in consequence of the removal of its traffic to the canals. He says,—

> Useful to the commerce of the country, and laudable as the enterprise of forming navigable canals all over the kingdom must be acknowledged to be, it is still with some regret we view the old stream falling almost into total neglect and disuse. Such, however, in this neighbourhood, [*i.e.* near Radcote Bridge,] during the summer months is the situation of this noble river, which is then shallow in water, and overgrown with osiers and weeds; its locks and weirs are fast falling into decay; and in many places we find only a few old timbers remaining, to mark where such aids to navigation were once thought of utility.

The *weirs* here alluded to are a primitive kind of lock-gates, frequently seen in the higher parts of the Thames. They are artificial dams or banks, carried across the river in order to pen up the water to a certain height, for the services of the mill, the fishery, or navigation. A large range of frame-work, which resembles the railing of a bridge, rises from the bank below, and supports a number of small flood-gates, sliding in grooves, and connected with a sill in the bottom. When these are drawn up, the whole body of the stream, being collected into a narrow space, rushes through with great rapidity, and gives a temporary depth to the shallows, or, by the power of the current, forces the barges over them. These weirs add much more to the beauty of the landscape than the more still and mechanical locks of a canal. They are generally connected with various accessory and diversifying circumstances: a mill, a fisherman's hut, or the cottage of a toll-collector, sometimes embowered in trees on the bank of the river, heighten and vary the beauties of the scene. The weir, in its most simple state, breaks the line of the river, produces a kind of waterfall, and gives activity and eddy to the current; but when the river is high, the overflow of the water forms a large cascade. The upper stream continuously forces its way onwards, "in some parts," as it has been observed, "spouting through the apertures of the flood-gates; in others fretting through the moss-grown timbers, or rushing over the aquatic plants that cling to the frame work; and thus, broken into a thousand various rills, falls into the lower water, and continues to enliven the course of the river."

We now arrive at a part of the river which receives the waters of the Windrush, a stream which traverses

Oxfordshire, and passes the town of Witney before discharging itself into the Thames. Witney has long been famous for the blankets manufactured there, and it has been supposed that the whiteness of these blankets is due to the large quantity of nitre wh.ch is found in the water of the Windrush. Farther on we come to Stanton Harcourt, a small town celebrated for the events which occurred there many centuries ago, and for the venerable residence of the Harcourt family. This mansion was in the possession of the Harcourts for more than six hundred years, the representative of the family being created a baron in the reign of Queen Anne, and an earl in the year 1749. The mansion has been greatly altered in modern times. A small chapel belonging to the building had a tower containing three apartments, the uppermost of which was called Pope's study, from the circumstance of the poet having occupied it during a whole summer which he spent at the mansion. Here he finished his translation of the fifth book of Homer's Iliad, which circumstance he recorded, with a diamond on a pane of red glass, subsequently preserved with great care by the owner of the mansion.

Proceeding further eastward on our journey, we come to Eusham Bridge, an object surrounded with picturesque scenery. The river expands considerably about this part, and meanders amid the neighbouring meadows, fertile in pasture, and screened by the contiguous hills, which form a gentle slope towards its margin. On the northern side the various breaks in the distant scenery, the happy combination of villages with pastoral country, give great beauty to the landscape.

A little eastward of this bridge, the river takes a very sudden bend towards the south near the town of Woolvercott; increasing both in width and depth towards Oxford, and, to use the words of an old topographer, "seems proudly urging its course, to pay its tribute to that ancient and noble seminary of learning, whose venerable towers and lofty domes all happily unite to form a general mass of objects superior to anything which this country can boast."

We have approached a part of the river nearly parallel with Woodstock and Blenheim, at a few miles from the northern bank; but these celebrated places, and their historical recollections, we must leave for our second paper.

ON OPTICAL ILLUSIONS.

No. I.

It would be a curious inquiry, and one fruitful in valuable information, to investigate the instances in which, and the causes by which, natural objects appear to be what they are not. Such an inquiry would lead to many remarkable results, and would serve to furnish some evidence of the manner in which our notions of form and configuration originate. We wish to draw the attention of those readers who have but recently entered on the study of science, to this subject, assuring them, at the outset, that they will be amply repaid for the time employed in the inquiry.

If we analyse our notions of form and figure, we shall find that we depend almost entirely on the kind and degree of light which is reflected to the eye from any object under consideration. If we have, for instance, a marble bust, and a chalk or Indian ink drawing of the same individual, how do we know, without touching them, (for that is a species of evidence, which we exclude from the present inquiry,) that one is a raised bulk, while the other is a flat surface? Principally from the degree of light which comes to the eye from the different parts of the object. We know—experience has taught us—that every projection or elevation reflects more light from that side which is nearest to a window, or to a lighted candle, than from the other side; and upon placing one of the objects above alluded to in different positions with regard to the window, if we find that the dark side of every elevation in the face is directed from the window, we immediately conclude that that is the bust and not the drawing; but if we find that, when we place it at one side of the room, the shaded part of the nose, or of any other prominent part, is towards the window, but that when it is on the other side of the room the shaded part is from the window, we immediately conclude, without placing the hand on either object, that we are looking at the drawing, and not at the bust. And this would be the case if the drawing were coloured precisely to imitate the bust. This is a circumstance which should always be attended to in placing a portrait in a room; if the painted shadows do not correspond with the positions of the real shadows on that side of the room the illusion is greatly lessened.

These remarks apply to elevations above the common surface of an object, but our notions of depression are formed exactly in a similar way. We should find that if we could change the appearance of every spot in a raised object from light to dark, and from dark to light respectively, the mind would at once determine that we were then looking at a depressed or hollow cavity, the exact type of the raised object which we were before regarding; we should find that no other element would be called for in fixing our ideas.

Sir David Brewster has beautifully illustrated this singular fact by referring to the effect produced on the appearance of an intaglio (sunken device), or a cameo (raised device), when viewed through a microscope, or any assemblage of lenses which inverts the object.

If a common seal, or intaglio, be held near a window, the parts farthest from the window receive most light; while if the cast or impression produced from that seal, which may be regarded as a cameo, be similarly viewed, the parts nearest the window will receive most light; and it is in that way that we immediately know the elevated from the depressed image.

Now, the effect of viewing this same seal through a microscope, is to invert the position of the object; and consequently, if we confine our attention to any given depressed point of the seal, we should find that the light and the dark sides of that depression had changed places, and the shaded side of every little elevation and depression would be exactly in the same position as if we were viewing a cast of the seal without a microscope.

It will even be found that a very slight effort of the mind will be sufficient to produce this effect without any lenses whatever: suppose an intaglio be viewed at night, with a candle at the left of the observer; let him then fancy that the candle is on his right hand, and the idea that he is viewing a cameo will immediately impress itself on his mind. That the direction of the shadow is the real evidence on which we form our opinion as to the character of the surface which we are viewing, is farther borne out by this fact: that if we hold an intaglio and a cameo exactly opposite to the source of illumination, it is difficult to distinguish one from the other, as both sides of every elevation or depression are nearly equally illuminated.

If we consider for a moment, in what way we distinguish a concave from a convex surface, we shall find that it merely consists in a different distribution of light and shade: those parts which are light in the one, being shaded in the other and *vice versâ;* the deception produced in objects of this form, by inverting the position of the image, is most striking, and affords one of the best instances of the fallacy of our reasoning, when we lose one of the data on which we ground our inferences.

If we take any bright convex or concave surface, no matter what the material, and place it between the window and the eye, so that the eye sees it by looking downwards at an angle of from 20° to 60°, there is a certain distribution of light and shade on the object,

which enables the eye, from habit, to determine whether it be convex or concave; if we can now invert the position of the edges of the object, with reference to the eye and the window, the shaded parts assume just the position which would be assumed by the opposite curvature. This inversion may be done without any lenses whatever. Take a common Wedgwood-ware evaporating-dish, or a common tea-saucer, a basin, or any object which is concave on one side and convex on the other—a watch-glass even will do,—and place it on a table between the observer and the window, with the concave side upwards; then hold a piece of common glass (with the under side blackened) in such a position that an image of the object will be reflected from its surface to the eye. The laws of optical reflection teach us, that the rays from the farther edge and those from the nearer edge cross each other in their passage to the eye, and assume an inverted position; and it will now be seen that the object has every appearance of being a convex surface, and if the angle of observation be well chosen, (which depends partly on the height of the window,) the illusion is so strong that it can scarcely be removed from the mind. If a convex mirror be substituted, and its position well adjusted, the distortion will present all the appearance of a concave mirror.

It is not essential to this experiment that the reflector should be black on its under surface, although it is more favourable for the purpose; any polished surface will suffice, provided it receives the rays at a large angle of incidence: it can be seen very well by reflection from one of the faces of a prism, and a singular effect is produced by a particular adjustment of the prism, by which two images of the same object may be conveyed to the eye within a short distance of each other; one is the regular refracted and transmitted image, and the other a reflection from one of the internal faces of the prism: one of these images will appear convex, and the other concave, and their juxtaposition forms a very remarkable appearance—one being prismatically coloured and convex, and the other of its natural colour and concave.

If the student in optics carefully considers the law that "the angles of incidence and reflection are always equal," and will carry out that principle to its fullest extent, he will find that every one of the phenomena of which we have been treating depends almost solely on the operation of that law; if he considers the position of the source of illumination, the degree of curvature of the surface on which any ray falls, and the angle at which the eye receives the reflection, he can clearly show that that law determines what part of the object will appear bright and what part shaded.

In a memoir submitted by Professor Wheatstone to the Royal Society, two or three years ago, he enters at considerable length into the causes and nature of many phenomena connected with vision; and among them are the relative appearances of an intaglio and a cameo. But the results to which that gentlemen arrived, and which we shall briefly explain in a future paper, do not disturb the results described in the last few paragraphs: we are treating of that class of illusions arising from shadows, and their relative position with regard to the light parts of an object; but Mr. Wheatstone's experiments relate to a more extensive and highly curious comparison between the phenomena observed with one eye and those observed when both eyes are open. But more of this hereafter: the details of our present article are equally true, whether one eye or both eyes be employed.

The optical law to which we have alluded, namely, that "the angles of incidence and reflection are always equal," determines the production of another phenomenon, as remarkable and much more beautiful than the former. If we take a plate of looking-glass, and sprinkle a few grains of dust upon it, and view it perpendicularly with one eye at a few inches' distance, the dust appears arranged in a most beautiful radiating star, of which the eye is the centre; it matters not how unequally it is scattered; the symmetry is invariable.

Now in such a case as this, before we begin to theorize, it is proper to extend the experiment to other objects; and in accordance with this, it will be found that if the object be a polished surface of steel, of silver, of mercury, or any substance but silvered glass, no such radiating appearance presents itself; if now the student reverts to the law above alluded to, he will at once detect the cause; when the dust is scattered on the surface of silvered glass, an image of each little particle is reflected from the *mercurial surface*, through the glass again to the eye; as the angle at which we view any particle increases, so must the apparent distance between it and its image increase, until we arrive at 45°, which gives the maximum of distance.

Now the particle and its reflected image are in the same vertical plane which passes through the eye and the image of the eye; the particle, its image, and the image of the pupil of the eye appear, therefore, to be in the same right line, and as the same applies to every particle, as the line which joins the particle and its image would pass, if produced, through the image of the pupil of the eye, wherever the particle be placed, the pupil appears to be a nucleus or centre from which all these double images extend radially outwards.

When, however, a polished metal is used, there is no reflecting surface from which a second image can be obtained, and we therefore see the particles themselves unaccompanied by any reflected image, and the symme, trical appearance is not then produced. The employment of a concave mirror affords an excellent proof that this beautiful radiating appearance is the effect of reflection. If we hold the eye at the focus of the mirror—that is, at the centre of the sphere of which the mirror is a section—we see none of these radial lines, but as we approach near to the mirror, they gradually develope themselves; this arises from the circumstance, that when the eye is at the centre of the sphericity, incidence and reflection are both perpendicular to the mirror, or rather, the reflected image is concealed by the particle itself, and therefore cannot reach the eye; but when we approach nearer, the images of the lateral particles become visible, and the starry effect begins to appear.

In a *convex* mirror the effect is very beautiful, on account of the increased obliquity which its curvature gives to the incident ray, and the non-existence of a focal point in front of the mirror.

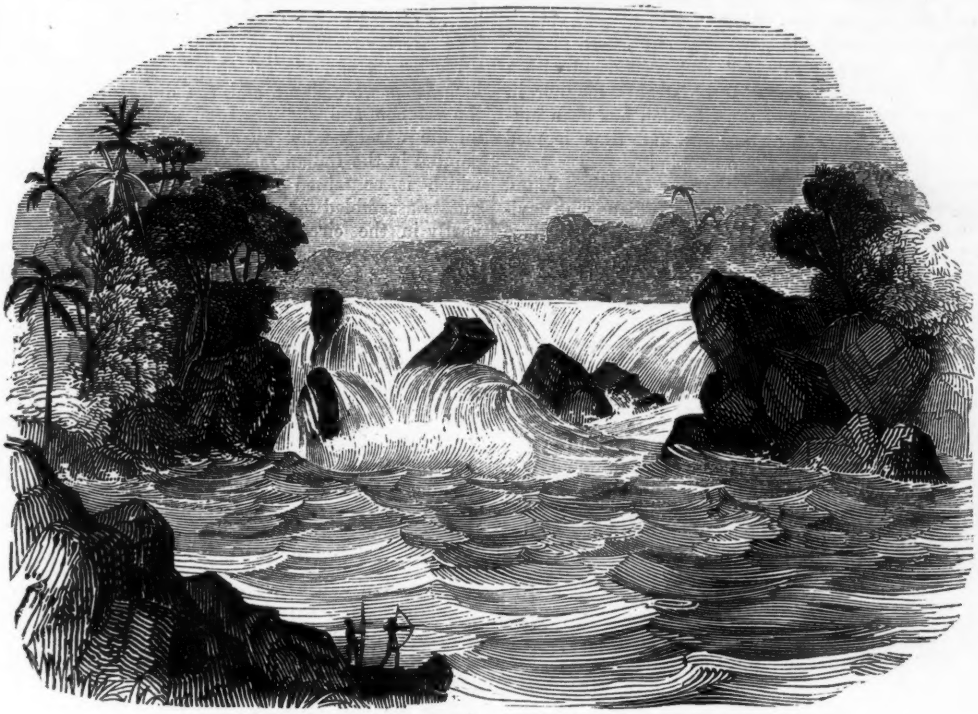
The effect is greatly heightened by mixing powders of two different colours,—red and green, or blue and orange, for instance,—as those colours which are complementary to each other produce a singularly pleasing effect by their juxtaposition. A very slight sprinkling of milk, or any coloured liquid, likewise produces this symmetrical effect.

Instead of using glass, we may use two fluids of different densities and different refractive powers, but the two which best answer the purpose are water and mercury; if a little powder be sprinkled on the water, it will be reflected from the mercury under the water, and the same effect produced as with glass, but the latter is the more convenient of the two.

If the eye be directed to one corner of the glass, the particles will have the appearance of an expanded fan, emanating from that corner.

Thus may the same simple law be brought to bear upon the whole of the appearances which we have now detailed: in all these instances an object, or an assemblage of objects, appear to be what they are not, simply from our neglecting to seek for an explanation from the only sources to which we should apply in such cases, namely, the unerring laws of Nature, the simplicity of which is as conspicuous as their beauty and their universal application.

BRITISH GUYANA.



KING WILLIAM THE FOURTH'S CATARACT ON THE ESSEQUIBO.

IV. Ascent of the Essequibo.

In our last paper on Guayana we traced the principal objects worthy of note on the river Massaroony. We now start from the point where that river enters the Essequibo, and accompany Mr. Schomburghk in the ascent of the latter river.

This gentleman was accompanied by two other Europeans, nine negroes, and ten Indians, who embarked in three *coorials*, or canoes. The party proceeded up the river, meeting with but few traces of man's works, but abundant examples of the beauties of natural objects. Here a rapid occurs,—there a sand-bank gives a tortuous course to the river,—farther on are banks covered with luxuriant vegetation. Opposite a small island in the river, called Hoobucuroo, there is one dense mass of foliage, arising from trees of almost innumerable growths; among which are the majestic *mora*, with its dark-leaved branches,—the mimosa, whose wood is almost equal to oak for ship-building,—the stately saouari, which bears a rich and nutritious nut,—the sirwabally, excellent for planking vessels and resisting the attack of worms,—the water guava, which replaces the mangrove of the seashore, and yields an aromatic leaf, useful as a medicine, and many others. Mr. Schomburghk also observed how frequently small parasitical plants had wound themselves round larger stems. The wild vine, or bush-rope of the colonists is seen at times twisted like a corkscrew round the loftiest trees, intertwined like the strands of a cable, then drooping to the ground, and again taking root, and thus, as it were, securely anchoring the tree against the fury of the sweeping blast. Sometimes too may be seen the wild fig-tree, an unusual parasite, taking root in some of the topmost branches of the *mora*, deriving nourishment from its sap, and being, in its turn, entwined by varieties of the climbing vine.

Farther up the river the travellers met with a party of natives,—men, women, and children: the women were employed spinning cotton for hammocks, in a hut open on all sides, and badly roofed with palm-trees. Cotton, dipped in bees'-wax, afforded artificial light in the evenings.

About twelve years ago Lieutenant Gullifer and Mr. Smith ascended the Essequibo, and met with some of the natives under circumstances which show how grievously low is the state of their civilization. We must remark, however, that the individuals to whom the following narrative relates, were not the regular American Indians of Guyana, but belonged to the more fierce tribes called Caribs.

The travellers being received courteously by the chief of the tribe, a dish of fish, with savoury sauce, was placed before them, which being removed, two human hands were brought in, and a steak of human flesh. The travellers, as may be supposed, declined to eat of such food, but the chief picked the bones of the hands, apparently with great relish; and he afterwards said to his visitors—"Human flesh makes the best sauce for any food: these hands and the fish were all dressed together. You see these Macooshee men, our slaves; we lately captured these people in war, and their wives we eat from time to time." The travellers were horrified, but thought it prudent to conceal their feelings, and before they retired for the night they remarked that the Macooshee females were confined in a large logie, or shed, surrounded with a stockade of bamboos; and the whole aspect of affairs afforded reason to believe that the sickening recital was but too true.

It is instructive to observe how generally and almost universally prevalent is the idea that at some past period in the history of the world the surface of the globe was inundated by a deluge. An instance of this kind is furnished by the Arawaks of Guyana. Their tradition of the Creation is that the Great Spirit sat on a silk cotton-tree, and cut off pieces of bark, which he threw into the stream below him, and, becoming animated, they assumed the forms of all animals; that man was last of

all created; that a deep sleep fell upon him; that he was touched by the Great Spirit, and found, when he awoke, a wife by his side. The world becoming desperately wicked, was drowned by a flood, only one man being saved in a canoe, from which he sent out a *rat*, to discover if the waters had subsided, and it returned with a head of Indian corn. Such is the strange manner in which the Mosaic account of the Creation has been mutilated and mixed up with absurdities, and thus handed down as a tradition among these people!

In proceeding up the Essequibo our travellers found a curious custom to prevail among the Indians who navigated the canoes. Whenever they came to a place which the Indians had not visited before, they had tobacco-juice squeezed or squirted into their eyes,—to avert the Evil Spirit! This was done on the occasion of arriving at a remarkable pile of large granite boulders, near the banks of the river. The boulders rise perpendicularly to the height of about a hundred feet, and appear to enclose a large cavity, partly covered by a square mass of granite.

Among the numerous trees and plants found in this neighbourhood, is that which produces the gum elastic; the wood of which has much the appearance of the sycamore. The gum is contained in the bark; and when the latter is cut through, the gum oozes out very freely: it is quite white, and looks as rich as cream. It hardens almost immediately on issuing from the tree; so that it is very easy to collect a ball, by forming the juice into a globular shape as fast as it comes out. It turns nearly black on being exposed to the air, and becomes real Indian rubber without any farther preparation.

Waterton speaks in enthusiastic terms of the scenery on the banks of the Essequibo. At one spot is a savannah at the edge of a forest, which he thought excelled in beauty any park in England. It consists of about two thousand acres of grass, with here and there a clump of trees, and a few bushes and single trees, scattered up and down by the hand of nature. The ground is diversified with moderate undulations; and near the middle is an eminence, gradually rising from every side, and occupied by Indian huts:—

This beautiful park of nature, (says he,) is quite surrounded by lofty hills, all arrayed in superbest garb of trees; some in the form of pyramids, others like sugar-loaves, towering one above the other, some rounded off and others as though they had lost their apex. Here, too, hills rise up in spiral summits, and the wooded line of communication betwixt them sinks so gradually that it forms a crescent; and there the ridges of others resemble the waves of an agitated sea. Beyond these appear others, and others past them; and others still farther on, till they can scarcely be distinguished from the clouds.

Amid scenes such as these, diversified with rapids, falls, shoals, and small islands, the traveller up the Essequibo finds himself; seeing no relics or traces of the "white man," but meeting here and there with small parties of the natives. At one part of his voyage Mr. Schomburghk met two canoes full of natives going to trade at the Demerara river. Their canoes were loaded with hammocks, large balls of spun cotton, bows, tobacco leaves, parrots, macaws, and other articles for barter. The chief, as a distinguishing mark, wore a crown of macaw feathers; and trafficked with the travellers, exchanging some of his commodities for scissors and knives.

When we arrive at a distance of about two hundred and forty miles from the mouth of the river, we meet with the river Rupunoony, which empties itself into the Essequibo. Up this river Mr. Schomburghk proceeded, and met with many picturesque groups of natives. At one spot, in a fine savannah, he saw a dome-shaped hut, and two smaller open ones, which were prepared for a piwarry feast among the natives. The men all came forward, and greeted him by waving the hand. He then looked in at one of the open huts, where he saw women and children occupied in baking fresh cassava bread. At his appearance, children, dogs, fowls, parrots, all set up a cry of affright; so he left them and went to inspect the dome-shaped hut. It consisted of palm leaves plaited neatly together, with a plastered entrance. The interior resembled a cupola or dome, supported by three beams and several oblique posts. Around it the hammocks were slung, and the different implements of the kitchen and chase ranged against the walls. The middle was occupied by a wooden trough, carved and painted in the Indian fashion, and filled with piwarry, of which it contained as much as sixty gallons. The guests assembled for the feast had slung their hammocks partly in the circular hut, partly in one of the open huts, while others stood outside, each party being attended by a person highly painted and ornamented for the occasion, to bring them the intoxicating liquor when wanted. On a signal given by the host, or one of the guests, the calabash was filled and handed to the person who desired it: it was then given to his next neighbour, and so on till emptied; after which it was filled again, and the same round occurred. This was continued until the trough was emptied, after which a new supply was made, and the men continued drinking until they became,—first highly elated and boastful,—and then torpid and sleepy.

Mr. Schomburghk, after speaking favourably of the behaviour of the Indians towards their children, says,—

They show much more attention to their wives than I should have expected from what I had read. I allude to the Caribbees, where the women appear to be considered more as companions than slaves. They certainly must work hard; the men clear the ground, and the women have to cultivate it, and to bring in the crop; but they are by no means the low slaves and drudges which they have been represented. There is one great failing which unfortunately appears to prevail among all the tribes—neglect of old persons, and the sick: they are stowed away in a small corner of the house, neglected, and left to themselves; and where weakness keeps them to their hammocks, perhaps often without the necessaries of life.

During the journey, the travellers occasionally crossed the savannahs, hills, and forests, to visit any remarkable spot, and on some of these occasions they had opportunities of seeing the mode of march known as "Indian file." The party, on one occasion, consisted of eighteen individuals; and as the path leading through the savannahs was not more than six or eight inches wide, each person had to follow closely in the footsteps of the one before him. Sometimes the path was lost, or became still narrower than that here indicated, but this was immaterial to the Indians; for their peculiar method of walking with the toes inward enables them to walk the smallest path with ease. They ridicule the European mode of walking, observing that in a wood we take up too much bush-room.

The exploring party ascended the Essequibo to a point where a fine cataract became visible, which, according to the opinions of all the Indians present, had never before been visited by a white man The river contracted considerably at this part: the hills approached each other from both sides; and the indentations of the opposite shores were so exactly matched, that the channel appeared to have been the work of art. After paddling up the river in canoes, the cataract was seen by the travellers. Numerous conical hills of granite, about three hundred feet in height, and covered with luxuriant verdure, contract the river to a width of fifty yards, where the whole body of water dashes down a precipice of fifteen feet; then foams over a rugged bed of rocks for about twenty yards; and again precipitates itself, ten feet, to the basin below. The rich vegetation luxuriating in all the fertility of a tropical clime,—the masses of granite projecting into the river, and hemming it in to its narrow limits,—and the foaming waters in the background, bearing away everything opposed to their progress,—combined to form a scene, more picturesque and beautiful than had been met with by the

travellers in any part of their journey. Mr. Schomburghk named this cataract after King William the Fourth, who was at that time patron of the Royal Geographical Society, by whom this expedition was planned, and to whose valuable Journal we are indebted for the illustrations to the present series.

When the travellers had returned nearly to the point whence they set out, many of their specimens of Natural History were lost by the upsetting of a boat; respecting which Mr. Schomburghk observes,—

This is too frequently the lot of the traveller. After having amassed treasures of Natural Science, and having taken every pains to preserve them, weather, accident, negligence, and malice, often conspire to deprive him of them. How frequently was I obliged to use every persuasion to induce the Indian to carry the Geological specimens collected during our pedestrian tours! I might have loaded him with provisions, wearing apparel, &c., and he would not have objected to it; but to increase his burden, by adding rocks, he thought, could only be done out of mischief; therefore I had been more than once under the necessity of carrying the specimens myself.

Nearly all the specimens here alluded to, as well as many specimens of plants and animals, were lost or spoiled by the disaster with the boat.

We need not trace the route of the travellers to the sea shore. Suffice it to say, that the banks of the Essequibo and the Rupunoony present dense forests, rich savannahs, a luxuriant display of animal and vegetable life; but that the few inhabitants consist wholly of the coloured races.

EULER, THE MATHEMATICIAN.

There are but few chapters in Biography more strikingly illustrative of the ardent love of knowledge, and its pursuit under circumstances of pain and difficulty, than that supplied by the life of Leonard Euler the mathematician.

This great man was born at Basle, in Switzerland, on the 15th of April, 1707. His father was minister of the village of Riechen, where Euler passed his earliest years. After receiving a good education from his father, he was sent to the university of Basle, where he soon became distinguished for his extraordinary memory and the uncommon celerity with which he accomplished his academical tasks. He devoted all his leisure to geometry, which was his favourite *pastime*. His progress in this noble department of science, gained for him the notice of John Bernoulli, then the first mathematician in Europe, as also the friendship of Daniel and Nicholas Bernoulli who were already emulous of the fame of their illustrious father. In 1723 Euler delivered a discourse in Latin on the occasion of taking his degree as Master of Arts, and the subject of his theme was the philosophy of Newton in comparison with the Cartesian system. This effort gained its author great applause. He afterwards applied himself to the study of theology and the oriental languages with considerable success; but as his ruling taste led him to prefer geometry to all other pursuits, he obtained his father's consent to adopt this in preference to any other. He continued on terms of friendly intimacy with the Bernoullis, and one consequence of this connection was his subsequent removal to the Academy of Petersburg, an institution projected by Peter the Great, and executed by Catherine the First. The two young Bernoullis being invited to Petersburg in 1725, promised Euler, who was anxious to accompany them, to exert themselves to obtain for him a settlement in that city. In the mean time he adopted their advice, and applied hmiself with ardour to the study of physiology and several branches of physical science. He also wrote a memoir on the propagation of sound; and an essay in answer to a prize question concerning the masting of ships, to which the Academy of Sciences, in 1727, adjudged the second rank.

The splendid talents of Euler would easily have procured for him an honourable preferment in his native city, had it not been that both civil and academical honours were distributed there by lot. Having failed in his attempt to obtain a certain situation at Basle, he went to Petersburg, where he became joint professor with his countrymen, Hermann and Daniel Bernoulli, in the university of that city. He soon added many valuable memoirs to the academical collection; and this excited a noble emulation between him and the Bernoullis, which always continued without the least interference of envy or the disturbance of their friendship. In 1730 he became professor of natural philosophy; and in 1733 succeeded Daniel Bernoulli in the mathematical chair: about this time also he married a Swiss lady named Gsell. In 1735 the academy proposed a problem, to which a speedy solution was required, but for which several eminent mathematicians had required several months. To the astonishment of every one, Euler solved it in three days; but the effort produced a fever which deprived him of the use of his right eye and nearly of his life. The Academy of Sciences at Paris, in 1738, awarded the prize to Euler, for his memoir on the nature aud properties of fire; and proposed for the year 1740 the important subject of the tides; a problem the solution of which required the most arduous calculations, and included the theory of the solar system.

Euler's discourse on this question was considered as a master-piece of analysis and geometry; and it was more honourable for him to share the academical prize with such illustrious competitors as Colin Maclaurin, and Daniel Bernoulli, than to have carried it away from rivals of inferior reputation. Rarely, if ever, did such a brilliant competition adorn the annals of the academy; and no subject, perhaps, proposed by that learned body, was ever treated with such accuracy of investigation and force of genius as that which here displayed the philosophical powers of these three extraordinary men.

In 1741 Euler received an invitation from the king of Prussia to visit Berlin; and being anxious to escape from the scene of those political intrigues which under a suspicious and tyrannical government then agitated Russia, he gladly accepted it. When he was introduced to the Queen Dowager she was so surprised at his taciturnity, that she required an explanation of it, and he told her that he had just come from a country where those who spoke were hanged. He contributed five memoirs to the "Berlin Miscellanies," and a large number on important subjects to the transactions of the Prussian Academy on the deepest parts of mathematical science, always containing new views, often sublime truths, and frequently important discoveries. At the same time he did not neglect to contribute largely to the memoirs of the Academy of Petersburg, which in 1742 granted him a pension. He also acceded to the request of the princess of Anhalt Dessau, to write for her own use a work on Natural Philosophy. On his return to Petersburg in 1766, he published his celebrated *Letters to a German Princess*, in which he discusses with clearness the most important principles of Mechanics, Optics, Sound, and Astronomy.

In the midst of all these absorbing pursuits, Euler did not neglect the ties of kindred, nor cease to be a dutiful son as well as an affectionate husband. On the death of his father he went to Frankfort, in 1750, and returned with his widowed mother to Berlin, where she lived until 1761, enjoying, with the feelings of a parent, the high distinctions which her son had attained by his genius and untiring activity. In 1760 a circumstance occurred which shows how greatly Euler was esteemed. The Russians having entered Brandenburg, proceeded to Charlottenburg, where they plundered a farm belonging to Euler. When General Tottleben was informed of the name of the owner, he ordered immediate reparation to be made to an amount far above the injury

sustained, to which the Empress Elizabeth added the additional sum of 4000 florins.

In 1766 Euler accepted the invitation of the Empress to return to Petersburg; but he experienced no small difficulty in obtaining permission from the king of Prussia to quit his territory, so much was he esteemed by that sovereign, who, although he spoke of Euler as being "*only* a mathematician," yet had sufficient discrimination to perceive that he added lustre to a court which aspired to science and literature. On his return to Petersburg, Euler was afflicted with a severe illness which terminated in the total loss of his sight. A cataract formed in his left eye which he had injured by too severe mental application. In this distressing situation he dictated to his servant, a tailor's apprentice and quite ignorant of mathematics, his ***Elements of Algebra***, a work as admirable for clearness and method, as for the distressing circumstances under which it was composed. The amanuensis is said to have acquired a good knowledge of Algebra, in the course of merely taking down what Euler spoke.

The Academy of Sciences of Paris elected Euler to the honourable post of foreign member of their body, and adjudged the prize to three of his memoirs, "Concerning the Inequalities in the Motions of the Planets." The two prize questions proposed by that academy for 1770 and 1772 were designed to obtain from astronomy a more complete theory of the moon. With the assistance of his son, Euler competed for these prizes, and obtained both. In his last memoir he reserved for further consideration several inequalities of the moon's motion, which he could not determine in his first theory, on account of the laborious calculations in which his method had involved him. But, with the assistance of his son and two other gentlemen, he carefully revised his theory, constructed tables, and published the whole in 1772.

All these means of investigation, employed with such art and dexterity as could only be expected from analytical genius of the first order, were attended with the greatest success; and it is impossible to observe without admiration such immense calculations on the one hand, and on the other the ingenious methods employed by this great man to abridge them, and to facilitate their application to the real motion of the moon. But this admiration will become astonishment when we consider at what period, and in what circumstances, all this was effected. It was when he was totally blind, and, consequently, obliged to arrange all his computations by the sole powers of his memory and his genius; when he was embarrassed in his domestic circumstances by a dreadful fire, which had consumed the greater part of his substance, and forced him to quit a ruined house, every corner of which was known to him by a habit that in some measure supplied the place of sight;—it was in these circumstances, and under these privations, that Euler composed a work, which alone is sufficient to render his name immortal. The heroic patience and tranquillity of mind which he displayed need no eulogy here: and he derived them not only from the love of science, but from the power of religion. His philosophy was too genuine and sublime to stop its analysis at mechanical causes; it led him to that divine philosophy of religion which ennobles human nature, and is alone capable of forming a habit of true magnanimity and patience under suffering*.

After this great work was completed, Euler was couched by the celebrated oculist Wenzell, and restored to sight; but the delight occasioned by this successful operation did not long continue. Partly by the neglect of his medical attendants, and partly by his own impatience to exercise his re-acquired powers he again became totally blind, and the relapse was accompanied by intense pain. This misfortune, however, did not check the ardour of his genius. He had engaged to supply the academy of Petersburgh with a sufficient number of memoirs to complete its Transactions for twenty years after his death, and, accordingly, with the assistance of his son and two other gentlemen, he sent to the academy seventy memoirs within the space of seven years, and left above two hundred more, which were revised and completed by the biographer of Euler, from whom we have just quoted.

If we consider the great extent to which Euler carried his researches in mathematics and astronomy, we shall be surprised to find that he was also skilled in the sciences of medicine, botany, and chemistry; that he was moreover a good classical scholar, and had read with attention and taste not only the principal Latin authors, but had made himself familiar with the civil and literary history of all ages and all nations. We learn also that intellectual foreigners, who had previously become acquainted with his mathematical and physical researches and discoveries, were astonished on visiting him to find that he also possessed an extensive acquaintance with the most interesting branches of literature. This wonderful memory doubtless made the acquisition of every kind of knowledge easy to him: as an example of the powers of his memory it is stated that he could repeat the Æneid of Virgil without hesitation from the beginning to the end, and even name the first and last line of every page of the edition which he used.

In September, 1783, he made some calculations on the motions of balloons, then newly invented. On the 7th day of that month he dined with Lexell and conversed on the subject of the newly discovered planet Herschell, and while his grandchild was at tea, he began to play with it, when he was struck with apoplexy, and died without pain.

Condorcet has left an eloquent and just summary of the character of Euler, which is thus quoted in the article before referred to:—

Euler was one of those men whose genius was equally capable of the greatest efforts, and of the most continued labour; who multiplied his productions beyond what might have been expected from human strength, and who, notwithstanding, was original in each; whose head was always occupied, and whose mind was always calm. The nature of his pursuits, by withdrawing him from the world, preserved that simplicity of manners for which he was originally indebted to his character and his education; and he employed none of those means to which men of real merit have sometimes recourse, in order to enhance the importance of their discoveries. It is true that fecundity such as his renders unnecessary all the little calculations of self-love; but still great lucidity of mind, and uprightness of character, are necessary to trace, as he has done, the history of his thoughts, even when his investigations have proved fruitless, or the results disappointed the expectations which he had formed. Euler's constitution was uncommonly vigorous; his health was good; and the evening of his long life was serene, being sweetened by the fame which follows genius, the public esteem and respect which are never withheld from exemplary virtue, and several domestic comforts, which he was capable of feeling, and therefore deserved to enjoy.

* *Encyclopædia Britannica.*

Pleasures are like poppies spread,
You seize the flower, its bloom is shed;
Or like the snow-falls in the river,
A moment white—then melts for ever;
Or like the borealis race,
That flit ere you can point their place;
Or like the rainbow's lovely form
Evanishing amid the storm—
Nae man can tether time or tide.

BURNS.

LONDON:
JOHN WILLIAM PARKER, WEST STRAND.
PUBLISHED IN WEEKLY NUMBERS, PRICE ONE PENNY, AND IN MONTHLY PARTS, PRICE SIXPENCE.
Sold by all Booksellers and Newsvenders in the Kingdom.